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[54] **LOCATING THE SOURCE OF AN UNKNOWN SIGNAL**

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[52] **U.S. Cl.** **342/353**; 342/444; 342/453; 342/465

[58] **Field of Search** 342/444, 450, 342/353, 357.01, 378, 453, 465

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[57] **ABSTRACT**

A method of determining the location of an unknown source (**10**) transmitting an unknown signal to satellite relays (**14** and **16**) comprises receiving the signal from the relays at respective receivers (**18**). The receivers (**18**) receive reference signals via respective relays from a common source (**22**). The unknown signal and reference signal received by each receiver (**18**) are processed coherently to preserve their timing and phase information relative to one another independently of signals received elsewhere. The signals are frequency downconverted and digitised, and transferred to a common processing computer (**150**). The computer (**150**) performs cross ambiguity function processing of the reference signals to determine their relative Differential Time Offset (DTO) and Differential Frequency Offset (DFO). It performs the like for the received unknown signals to determine relative DTO and DFO, relative time and frequency shifts being introduced between the unknown signals by incorporation of the reference signal DTO and DFO in order to enable the unknown signal DFO to be determined relative to the reference signal DFO. The reference signals are also employed to counteract phase noise and frequency drift effects in the unknown signals. From the unknown signal DTO and DFO the position of the unknown source (**10**) is calculated.

28 Claims, 8 Drawing Sheets